Study 3
Environmental Stress Cracking of Non-Metals

OBJECTIVES

1. Document non-metals uses and failures in space hardware
2. Document critical gaps in existing materials databases
3. Identify ground-based ESC test capabilities
4. Recommend materials for further characterization
5. Develop a test plan

FOCUS AREAS

- Polymers
- Extended Missions
- Spacesuits
  - Multi-layer insulations
  - Other films
  - Fiber fabrics
  - Bulk polymers
- Spacecraft structures
  - Composite matrices
  - Fiber reinforcement
- Habitats
- Rovers

CONCLUSIONS

1. Future space **missions are at risk**

   Multiple ESC and suspected ESC failures of space hardware are documented
2. **Data are sparse**
3. While test capabilities abound, there is **no NASA validated test method**
4. A list of materials has been provided

   These were chosen for likelihood of use, not ESC resistance
5. A test plan is recommended

RECOMMENDATIONS

1. Develop or validate a standard NASA ESC test method
2. Test target materials in single component environments
3. Write NASA ESC materials selection Design Specification
4. Test target materials in multi-component environments
5. Test target materials in *in-situ* environments
6. Develop or validate accelerated ESC testing